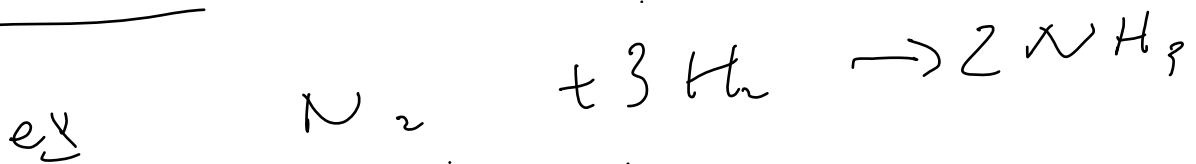


# ch. 3, b stoichiometry

- is the quantitative relationship between the amount of chemicals in a Rx

- able to determine amount of given amount of reactants
- amount of reactant, given amount product (or other reactant)

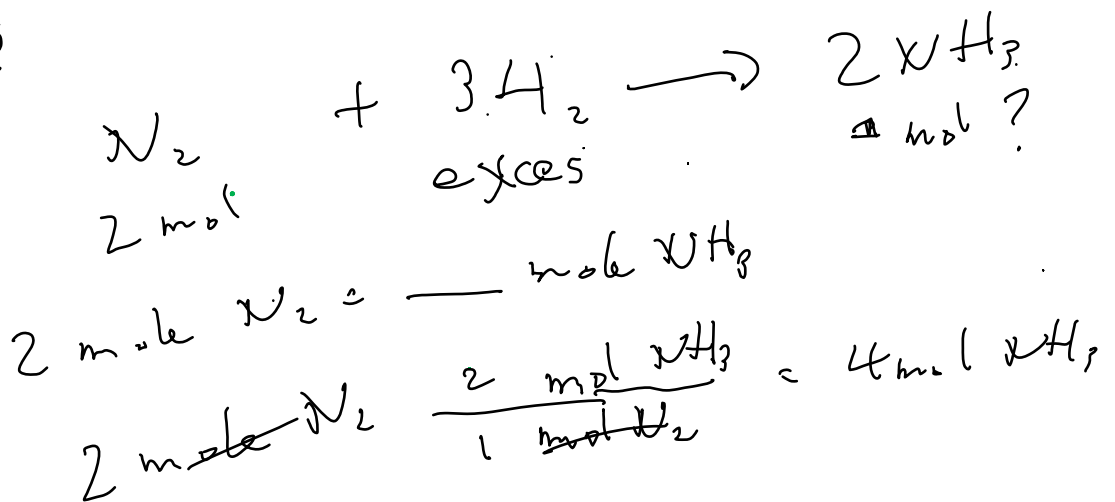
review/ recall chemical eqn

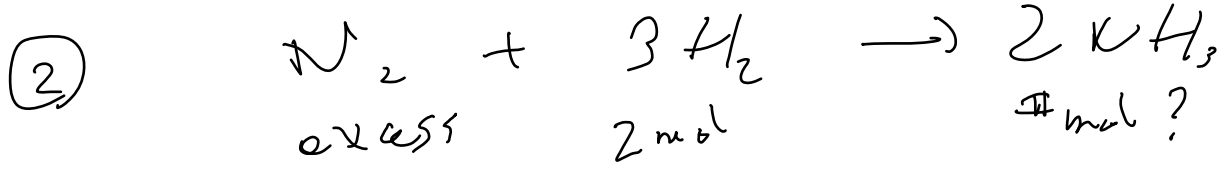


conversion factors

problems

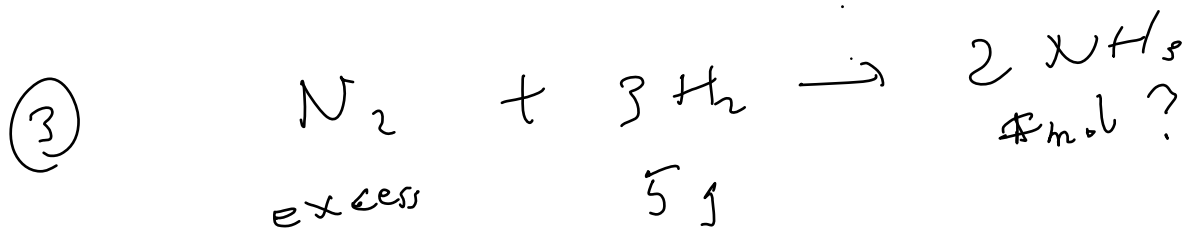
①



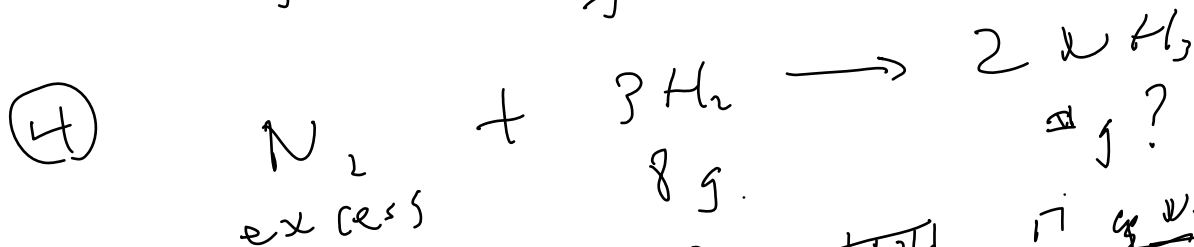


3 mol  $\text{H}_2 =$           mole  $\text{NH}_3$

$$3 \text{ mol } \cancel{\text{H}_2} \frac{2 \text{ mol } \text{NH}_3}{3 \cancel{\text{ mol } \text{H}_2}} = 2 \text{ mol } \text{NH}_3$$



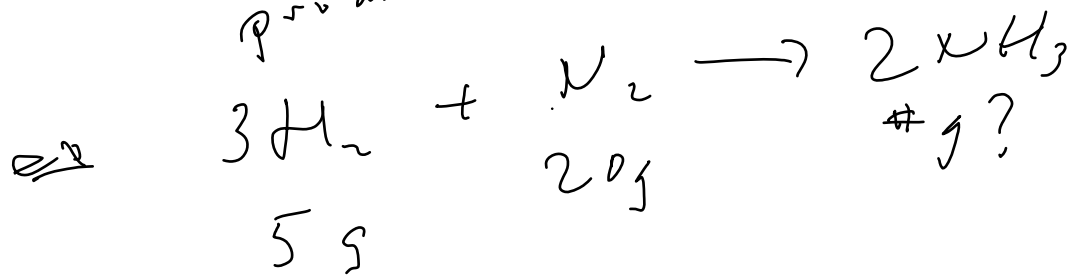
$$5 \text{ g } \cancel{\text{H}_2} \frac{1 \cancel{\text{ mol } \text{H}_2}}{2 \cancel{\text{ g } \text{H}_2}} \frac{2 \text{ mol } \text{NH}_3}{3 \cancel{\text{ mol } \text{H}_2}} = \frac{10}{3} = 3.3 \text{ mol } \text{NH}_3$$



$$3 \cancel{\text{ g } \text{H}_2} \frac{1 \cancel{\text{ mol } \text{H}_2}}{2 \cancel{\text{ g } \text{H}_2}} \frac{2 \text{ mol } \text{NH}_3}{3 \cancel{\text{ mol } \text{H}_2}} \frac{17 \text{ g } \text{NH}_3}{1 \cancel{\text{ mol } \text{NH}_3}} = 17 \text{ g } \text{NH}_3$$

ch 3.7 limiting reactant & % yield

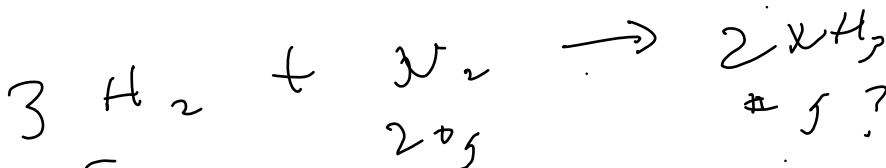
limiting reactant:  
 - limits or determines the amount of product(s) in a Rxn



method 1: "tedious"

steps

- i) determine the amount of a product, where assume a specific reactant is the limiting reactant
- ii) determine the amount of the product when the "other" reactant is limiting
- iii) answer = limiting reactant produces the least amount of product

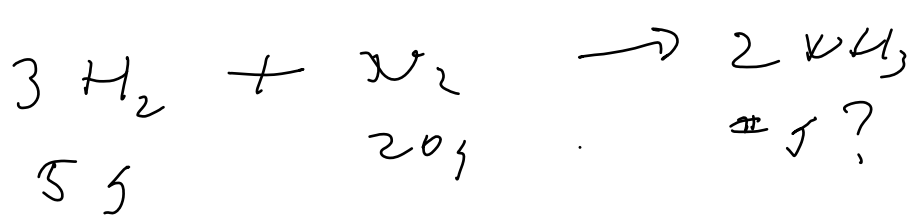


i)  $5 \text{ g H}_2 \times \frac{1 \text{ mol H}_2}{2 \text{ g H}_2} \times \frac{2 \text{ mol NH}_3}{3 \text{ mol H}_2} \times \frac{17 \text{ g NH}_3}{1 \text{ mol NH}_3} = 28.3 \text{ g NH}_3$

ii)  $20 \text{ g N}_2 \times \frac{1 \text{ mol N}_2}{28 \text{ g N}_2} \times \frac{2 \text{ mol NH}_3}{1 \text{ mol N}_2} \times \frac{17 \text{ g NH}_3}{1 \text{ mol NH}_3} = 24.3 \text{ g NH}_3$

method 2: "think"

- i) pick a reactant, then determine the amount of the other reactant needed to react with the "selected" reactant
- ii) compare amount of the other reactant present versus amount needed
- iii) identify the limiting reactant based on preceding comparison
- iv) calculate amount of product



a) pick  $\text{H}_2 \rightarrow$   $\text{N}_2$  needed?

$$5 \text{g H}_2 \times \frac{1 \text{ mol H}_2}{2 \text{ g H}_2} \times \frac{1 \text{ mol N}_2}{3 \text{ mol H}_2} \times \frac{28 \text{ g N}_2}{1 \text{ mol N}_2} = 23.3 \text{g N}_2 \text{ needed (to react with 5g H}_2)$$

have 20g  $\text{N}_2$ , where there is not excess  $\text{N}_2 \rightarrow \text{N}_2$  is limiting

blah blah - see above yellow high-lighted text

b) pick  $\text{N}_2 \rightarrow$   $\text{H}_2$  needed?

$$20 \text{g N}_2 \times \frac{1 \text{ mol N}_2}{28 \text{ g N}_2} \times \frac{3 \text{ mol H}_2}{1 \text{ mol N}_2} \times \frac{2 \text{ g H}_2}{1 \text{ mol H}_2} = 4.3 \text{g H}_2 \text{ needed (to react with 20g N}_2)$$

have 5g  $\text{H}_2$ , so  $\text{H}_2$  is limiting

so  $\text{N}_2$  is limiting

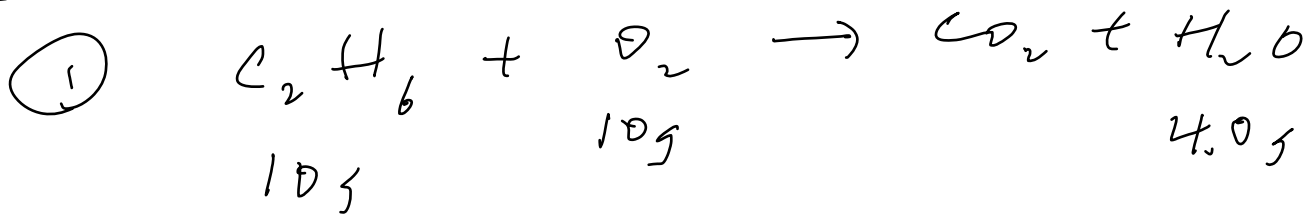
blah blah

% yield

yield: amount of product in a Rx

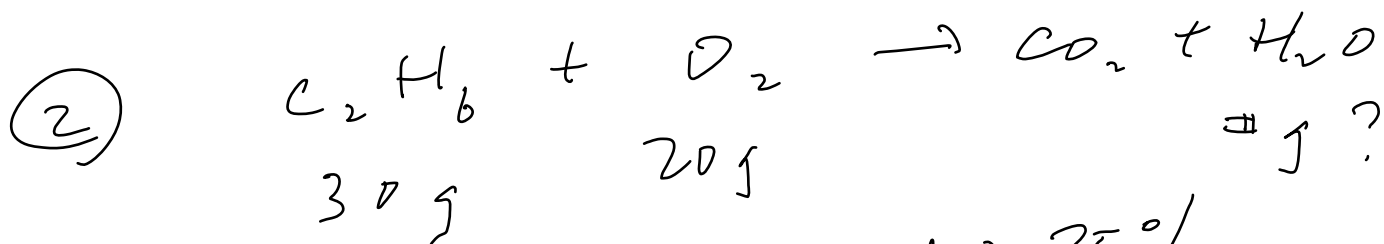
$$\% \text{ yield} = \frac{\text{experimental yield}}{\text{calculated yield}}$$

# Problems



find % yield

blah



assume % yield = 75%

blah